

AN IMPLEMENTATION INTENTION INTERVENTION TO IMPROVE CONSISTENCY OF  
SLEEP AND WAKE TIMES

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### **An Implementation Intention Intervention to Improve Consistency of Sleep Times**

Sleep behavior is a complex, necessary part of life. Although optimal functioning requires us to spend approximately one third of our entire lives asleep, relatively few individuals regularly obtain the sleep they need (Chokroverty, 2010; Grandner, Hale, Moore, & Patel, 2010; Williamson & Feyer, 2000). There are many recommended behaviors, commonly called “sleep hygiene”, that contribute toward obtaining quality sleep. The present research examines consistency of sleep schedule: The degree to which individuals consistently go to bed at the same time and wake up to start their day at the same time. Specifically, the proposed study applies the Theory of Planned Behavior (Fishbein & Ajzen, 2010) to predict both behavioral intentions to maintain a consistent sleep schedule and the degree to which individuals actually report maintaining consistent sleep schedules over a full week. Furthermore, the proposed study is designed to test an implementation intention intervention (Gollwitzer, 1993) for increasing sleep consistency.

## **Review of Relevant Literature**

### **Inadequate Sleep**

There are many documented deleterious effects of sleep deprivation. These effects can carry over into the physical, social, and cognitive domains. Some examples of short-term effects are: impaired attention-concentration, increased rates of absenteeism, reduced productivity, and increased work accidents (Chokroverty, 2010). Long-term consequences include increased morbidity and mortality (Grandner, et al., 2010), coronary artery disease, blood pressure dysfunction (Gangwisch et al., 2006), obesity, type II diabetes mellitus (Gottlieb et al., 2005), stroke, memory impairment, and depression (Chokroverty, 2010).

The cognitive and emotional impairments of sleep deprivation are particularly notable. One of the strongest pieces of evidence for the cognitive deficit that sleep deprivation can cause comes from researchers Williamson and Feyer (2000). They found that people who stayed up for 17-19 hours performed as poorly on a cognitive task as if they had a 0.05% blood alcohol content. Furthermore, people who stayed up for 28 hours performed as poorly as a person who has a blood alcohol content of 0.10%, over the legal driving limit in all states in the USA. Recent research concerning the emotional impact of sleep deprivation by Yoo, Gujar, Hu, Jolesz, and Walker (2007) used functional magnetic imaging to observe differences in amygdalar activation of sleep-deprived participants. They found that activity in the amygdala, on average, increased 60%. This is not beneficial, considering that increased amygdalar activity is associated with emotions such as fear and aggression. This finding suggests that the processing of these aversive emotions will be negatively affected (i.e., erroneously seeing negative emotions such as fear and aggression in other people who aren't displaying typical facial expressions of fear and aggression) and may effect subsequent interpersonal interactions.

At a basic level, it is likely that most people are aware that they typically need a certain number of hours of sleep to function well, however, there are many aspects of behavior that constitute good sleep behaviors beyond just sleeping enough hours per night. These positive sleep behaviors that have been identified collectively are called sleep hygiene. Sleep hygiene behaviors include: sleeping approximately 8 hours per night, maintaining consistent bed and wake times, avoiding caffeine and alcohol before bedtime, regular exercise but not close to bedtime, and only using the bed and bedroom for sleeping (Buboltz, Soper, Brown, Jenkins, 2002). People, for one reason or another, often don't perform these behaviors correctly if at all. Unfortunately, Gallasch and Gradisar (2007) found virtually no relationship between sleep

hygiene knowledge and actual sleep hygiene behavior. Indeed, sleep hygiene educational interventions typically results in rather small improvements in sleep (e.g., Morin & Wootin, 1996). So, simply providing facts about good sleep hygiene does not result in people getting better sleep.

It is then necessary to attempt to find theoretically based and empirically supported interventions that help people engage in good sleep hygiene behaviors. A promising approach that is relatively simple and cost effective is to apply the Theory of Planned Behavior (TPB) to identify the factors that best distinguish between those who do and do not intend to engage in good sleep hygiene behaviors. As presented below, behavioral intentions are predicted to be the best, most proximal predictor of actual behavior (Fishbein & Ajzen, 2010; Armitage & Conner, 2001, Armitage & Sprigg, 2010). However, the strength of the intention-behavior relationship varies, depending in part on the perceived and actual difficulty of carrying out the behavior. One approach to reduce the intention-behavior gap is to have participants specify an “implementation intention” in which they formally plan exactly where, when, and how they will engage in the behavior, rather than merely reporting their intention to do so (Gollwitzer & Brandstatter, 1997; Gollwitzer & Sheeran, 2006).

### **The Theory of Planned Behavior (TPB)**

The TPB is the most widely researched social-cognitive model of health behavior (Armitage & Conner, 2001). The TPB, also referred to as the Reasoned Action Model in a recent update by Fishbein and Ajzen (2010), posits that a very limited set of variables is needed to accurately predict intentions to perform a given behavior, and intentions are the direct antecedent of actually performing or engaging in the behavior (Ajzen, 1985). Ajzen (1991) states that intentions are assumed to capture the motivational factors that influence a behavior and indicate

how willing people are to try or how much effort they would exert to perform the behavior. If intentions to perform a behavior can be measured accurately, prediction of the target behavior should be fairly accurate as well.

TPB evolved out of Ajzen and Fishbein's (1980) earlier conceptualization; the Theory of Reasoned Action (TRA). The TRA only included two of the three antecedents to intentions that TPB has. Specifically, the TRA model includes attitudes and perceived normative pressure, but lacks the extra determinant of perceived behavioral control (PBC) that is included in TPB. The added facet of PBC increases the explanatory power of the model by allowing the prediction of behaviors that are not under complete volitional control (Ajzen, 1991; Armitage & Conner, 2001; Fiske & Taylor, 1991; Rodin, 1986). Most of the reviews conducted on TPB promote its efficacy in predicting a wide range of behaviors and behavioral intentions (Armitage & Conner, 2001; Cooke & French, 2008; Dalton & Spiller, 2012).

In the most recent conceptualization, each of the TPB predictors can be broken down into two components (Fishbein & Ajzen, 2010). For instance, attitudes can be broken down into instrumental and experiential components. The instrumental attitude component concerns mostly cognitive judgments such as considering whether personally performing a behavior is harmful versus beneficial, or of value versus worthless. In comparison, the experiential attitude component is more affective in nature (e.g., pleasant vs. unpleasant, enjoyable vs. unenjoyable). Perceived normative pressure can be broken down into injunctive and descriptive components. Injunctive norms deal with the degree to which one perceives that important, respected others think that the behavior should be performed, whereas descriptive norms concern the degree to which one perceives that important others are actually performing the behavior. Lastly perceived behavioral control can be broken down into capacity and autonomy components. Capacity refers

to one's perceived ability to successfully complete the target behavior (i.e., can you do the behavior). Autonomy deals more with how much the behavior is perceived as controlled by the participant, often measured by items asking the participant how much it is "up to them (i.e., do you have the ability to perform the behavior if you want to)."

Despite the success of the TPB, there is an intention-behavior gap (Walsh, De Fonsence, & Banta, 2005). Meta-analysis that has been conducted with TPB show that roughly 20-35 percent of the variance in behavior is accounted for by the model, an impressive amount compared to other approaches to behavioral prediction, but still leaves most of the variance unaccounted for. This implies that even when people have positive intentions they may often not perform the behavior. A common example of this is someone who spends money on a gym membership. The large financial commitment would ostensibly show a strong behavioral intention to exercising regularly, but they may inconsistently do so. Some mechanisms have been shown to decrease the intention-behavior gap. The main one that is cited in the research is implementation intentions.

### **Implementation Intentions**

Implementation intentions go beyond basic behavioral intentions by specifying when, where, and how a behavior will be carried out, resulting in an increased likelihood that the intention will be carried out given specific circumstances (Gollwitzer, 1993 as cited in Gollwitzer, 2012). Gollwitzer (1999) states that implementation intentions should take a very specific form: "If situation Y arises, then I will perform goal-directed behavior Z." Some postulate that implementation intentions work due to the fact that they form a special status in long-term memory, making it more accessible than other memory content in an if-then type format (Achtziger, Bayer, & Gollwitzer, 2012; Gollwitzer, 1999).

It is important to distinguish between basic behavioral intentions and implementation intentions. Basic behavioral intentions only identify the desired behavior or outcome (i.e., a goal intention), whereas implementation intentions specify in detail the “how”, “when”, and “where” the behavior is to be performed (Achtziger et al., 2012). Many studies have shown experimental efficacy of implementation interventions to change behaviors in the health related field that often suffer from an intention-behavior gap (Armitage, 2006). In fact, a meta-analysis of 84 studies conducted by Gollwitzer and Sheeran (2006) has shown medium to large effect sizes of implementation intention interventions. Examples of behaviors where implementation intentions have been found to be useful for behavioral change are: Watching and participating in exercise videos (Walsh, Da Fonseca, & Banta, 2005), recycling drinking containers (Rise, Thompson, & Verplanken, 2003), increasing food safety behaviors (Milton & Mullan, 2012), increasing fruit consumption (Knauper et al., 2011), decreasing harmful snacking (Karimi-Shahanjarini, Rashidian, Omidvar, & Majdzadeh, 2013), preventing adolescent smoking (Higgins & Conner, 2003), reducing alcohol consumption (Hagger, et al., 2012), increasing children’s fruit and vegetable consumption (Gratton, Povey, & Clark-Carter, 2007), decreasing BMI (Epton, et al., 2013), increasing home-based cardiac rehabilitation exercise (Blanchard, 2008), and decreasing drug use among teen poly-drug users (Amaud, Broning, Drechsel, Thomasius, & Beldus, 2012). These studies all used similar procedures for the implementation intention even though they were concerned with different behaviors. For example in Knauper et al. (2011) they were attempting to increase fruit consumption and when participants were assigned to the implementation intentions condition they first received a goal intention (consume more fruit). The participants were further asked to say to themselves, “I will consume extra portions of fruit each day for the next seven days.” They were then instructed to provide concrete if-then plans (implementation



intention) for the goal intention (e.g. If I am hungry for a snack, then I will eat an extra portion of fruit), and lastly were told to write down three specific if-then plans by identifying critical contexts (e.g. If I am in my kitchen getting a snack, then that snack will be fruit) in which to carry out the goal (Knauper et al., 2012).

Webb and Sheeran (2004, study 1) found that when implementation intentions are used participants show an increased speed and accuracy in the detection of the implementation intention cues. Specifically, participants more quickly recognized and were more accurate in pushing a button (behavior) when a specific number flashed on the screen (implementation intention cue) as opposed to other numbers or images (distractors). This suggests that the implementation intention strengthens the “if-then” relationship between cues and the target behavior (Achtziger et al., 2012). Other evidence suggests that implementation intentions can help with transitions between the stages of change from passive into a more active state (Armitage, 2006). Implementation intentions work because they are independent from motivation in that they are more volitional and chances are increased that decisions are acted upon. Additionally, some researchers postulate a special type of memory that is more easily assessable for implementation intention cues which would explain their effectiveness (Webb & Sheeran, 2007).

A difficulty of using implementation intentions in combination with TPB is that researchers are unsure of the effect that implementation intentions will have on PBC. The researchers conduct studies examining implementation intentions usually do so by only the manipulation of the implementation intention thus can be fairly confident that any behavior change is due to the implementation intention (Armitage & Sprigg, 2010). Some studies report that PBC increases after implementation intention; yet others report a decrease in PBC even

though the behavior is performed. It does seem that implementation intentions are more effective when the behavior is more difficult to perform. This is thought to be because easy behaviors are not met with a large intention-behavior gap whereas complex or difficult behaviors tend to have a larger intention-behavior gap. This is because the main influence of implementation intentions is upon the intention-behavior gap (Gollwitzer & Brandstatter, 1997), thus if there is no ability to improve the intention behavior relationship because it is so strong, implementation intentions will do nothing to improve the relationship between intention and behavior.

Some researchers suggest that past behavior would add more explanatory power to TPB (Sheeran & Orbell, 1999). What those researchers imply is that past behaviors usually have habitual or a minimally higher chance that the target behavior would or would not be repeated based on prior experiences. However, a recent study from Armitage and Sprigg (2010) found that implementation intentions significantly mediated the past behavior-future behavior relationship. Thus, adding past behavior may not allow for any extra explanatory power to the model because some of the power is overlapped by the implementation intention. The idea behind this is because the implementation intention is distinct and dealing with the future, past behavior's effect is less so on future behavior that is covered by the implementation intention (Armitage & Sprigg, 2010). Some researchers argue that past behavior is still a significant predictor of future behavior, and thus intentions are nothing more than a potent mediator of the relationship. This then implies that there may be other mediators of this relationship as well (Armitage & Sprigg, 2010). It is not that implementation intentions remove the influence of past behavior but it has been shown that implementation intentions ameliorate the strength of past behaviors effect on future behaviors (Armitage & Sprigg, 2010), but there is still disagreement.

An issue that could be a challenge to overcome with implementation intentions is that self-directed implementation intentions work better than experimenter-directed implementation intentions. A self-directed implementation intention is one that is freely chosen by the person or participant whereas an experimenter-directed implementation intention would be specified by the researcher themselves. This means that a person may be more likely to perform a behavior when they themselves choose the behavior and the situations in which they will perform the specified behavior. Counter to this argument, Armitage (2009) found that implementation intentions are less about who puts it forth, but more about mentally linking the situations with the behavior. This is important for this study because it will be a combination of experimenter-directed and self-directed implementation intentions. This is one of the more controversial points about implementation intentions and hopefully will be solved in time, but for this study the specific behavior is chosen by the experimenter (sleep consistency) and the specified situations surrounding performance of the behavior will be decided by the participants.

### **Purpose and Overview of the Present Study**

Given the ability of TPB to predict behavioral intentions, and the potential for implementation intentions to increase the intention-behavior relationship, I believe that in combination they can predict and improve bedtime and wake time consistency. The TPB has been documented recently to successfully predict a large amount of variability in intentions to engage in sleep hygiene behaviors, including sleep consistency (Stanko, Tagler, & Forbey, 2014). The reason that consistency of sleep and wake times are being used is because sleep consistency can contribute positively or negatively to other sleep hygiene behaviors thus compounding its effect. It also is an easily assessable component of sleep hygiene that

participants are already familiar with (i.e., set bed times and alarms to awake) and require no calculation on the part of the participant.

The proposed study is the first attempt to improve sleep behavior using implementation intentions. To assess consistency of bed and wake times, the present study examined the sleep habits of undergraduates over 7-days using sleep diaries in which participants recorded bed and wake times. Participants were randomly assigned either to an implementation intention intervention or a control condition. It was hypothesized that the TPB would accurately predict intentions and behavior to maintain a consistent sleep schedule and that the addition of PBC will provide extra explanatory power beyond intentions when predicting actual behavior. Secondly, it was hypothesized that implementation intentions group would have a stronger intention-behavior relationship than the control group. Lastly it was hypothesized that the implementation intention group would maintain more consistent sleep and wake times than the control group.

## **Method**

### **Participants**

I recruited 67 participants (30 female, 37 male) from the introductory psychology participant pool at Ball State University. All participants were between the ages of 18 and 29 years of age ( $M = 19.54$ ,  $SD = 1.82$ ). Participant ethnicities include Black/African-American ( $N=5$ , 7.4%), Asian/Pacific islander ( $N = 2$ , 2.9%), White/Anglo-American ( $N = 56$ , 82.4%), Hispanic ( $N = 2$ , 2.9%), and Multicultural ( $N = 2$ , 2.9%). Only participants who completed the sleep diary a minimum of five out of the seven nights were included in the analyses (following the procedures of Acebo et al, 1999; Stanko et al, 2013). Only one participant was excluded because they did not return for the follow-up appointment, thus were excluded from the analysis.

### **Measures**

Measures of the TPB variables were created according to the guidelines provided by Fishbein and Ajzen (2010). All measures specifically related to “maintaining consistent sleep and wake times each night for the following week”. These questions were designed to assess participants’ attitudes, perceived normative pressure, perceived behavioral control (PBC), and behavioral intentions towards maintaining consistent sleep and wake times. Cronbach’s alpha was used to assess each of the components internal reliability. All measures are presented in Appendix A.

**Attitudes.** Participants responded to fourteen 7-point semantic differential scales, intentionally selected to obtain both experiential and instrumental components of attitudes. The aspect of instrumental attitudes contains cognitive evaluations (e.g., “important vs. unimportant”). In contrast, experiential attitude measures assess more of an emotional evaluation (e.g., “pleasant vs. unpleasant”; Fishbein & Ajzen, 2010). The items were averaged to form a highly reliable scale with higher scores indicating more positive attitudes toward maintaining consistent bed times (Cronbach’s alpha = .90).

**Perceived Normative Pressure.** On seven point scales, participants responded to items designed to assess both components of perceived normative pressure; injunctive and descriptive (Fishbein & Ajzen, 2010). An example of an injunctive norm item is, “Most people who are important to me think that I should maintain consistent sleep and wake times.” An example of a descriptive norm item is, “Most people I respect and admire maintain consistent sleep and wake times.” The items were averaged together to form a reasonably reliable scale with higher scores indicating greater perceived normative pressure to maintain consistent bed times (Cronbach’s alpha = .75). Even though the reliability of this item is lower than the other items, this it is consistent with the theory (Fishbein & Ajzen, 2010) and well within acceptable levels.

**Perceived behavioral control.** Participants responded to eight statements that assessed their perceived level of behavioral control on 7-point scales. PBC is comprised of two components: capacity and autonomy. Capacity items assess confidence in ability. An example of a capacity item is, “For me to get eight hours of sleep per night would be (Impossible/Possible).” Autonomy items assess perception of personal control to perform sleep hygiene behaviors. An autonomy example item is, “How much control do you believe that you have over maintaining a consistent sleep/wake cycle?” (Definitely false/Definitely true). The items were averaged together to form a highly reliable scale with higher scores indicating greater perceived behavioral control to maintain consistent bed times (Cronbach’s  $\alpha = .90$ ).

**Intentions.** Intentions to perform the target behavior were assessed on six 7-point scales. Examples are “I intend to maintain consistent sleep and wake times in the next week”, and “I will make an effort to maintain consistent sleep and wake times for the upcoming week”. The items were averaged together to form a reliable scale with higher scores indicating greater intentions to maintain consistent sleep times (Cronbach’s  $\alpha = .84$ ).

**Sleep Diary.** Each person completed a sleep diary. These remain the standard method for recording sleep habits outside of the laboratory, often used when direct measures of sleep (e.g., polysomnography, actigraphy) is unnecessary or impractical (Carney et al., 2012; Ustinov et al., 2010). Sleep diaries included an equivalent number of sleep/nighttime measures as well as a wake/morning measures. The sleep/nighttime questionnaire (which was answered first) consists of questions relating to the past day (e.g., exercise, caffeine consumption). The wake/daytime diary included questions related to the previous night sleep, with the two critical questions asking the respondent to answer what time they went to bed and the time that they woke up. Consistency in bed times was quantified by calculating the standard deviation of bed

times and the standard deviation of wake times from each individual participant. These two consistency scores were significantly correlated ( $r = .45, p < .001$ ), and averaged for each participant to create an overall measure of sleep consistency. It is important to note that the standard deviation of bedtime and the standard deviation of wake times were also analyzed separately. The results, however, were not substantially different from the overall measure reported in the results section.

### **Procedure**

Participants recruited from the psychology research participant pool attended an initial 1-hour session in groups of up to five. An experimenter provided and read an informed consent form. Participants agreed to attend a second 1-hour meeting, scheduled at the same time exactly seven days from the initial meeting. The first meeting consisted of the participant responding to the TPB questionnaires that assess attitudes, perceived normative pressure, perceived behavioral control, and behavioral intentions for maintaining a consistent sleep schedule for the next seven days.

Participants randomly assigned to the experimental group were next instructed to complete the implementation intention. The implementation intention instructed the participant to define specific situations (i.e., how, when, and where) in which they will maintain consistent sleep and wake times. This form was then placed in the front of the sleep diary forms in their sleep diary so that each time that the participant opened the sleep diary the implementation intention was visible to them. Participants randomly assigned to the control group were instructed to fill out the Zimbardo Time Perspective Inventory (Zimbardo & Boyd, 1999) as a filler task.

Lastly, all participants received instructions for completing their sleep diary, emphasizing that it is important to complete the sleep/nighttime portion immediately prior to going to bed and the wake/daytime portion just after waking up. During the week of participation, participants received daily emails each day at 8:00am and 9:00pm that reminded them to fill out their sleep diary as well as when their day 7 appointment was. These emails were not intended to awake the participants, just to remind them to fill out the sleep diary. At the follow-up (day 7) appointment participants returned their sleep diary, completed the TPB questionnaire a second time (to see if the variables would change from time one to time two), and then were debriefed.

## **Results**

### **Descriptive Statistics and Bivariate Correlations**

**Average Bedtimes, Wake Times and Sleep Consistency.** Averaging across the week and then across all participants, participants reported a mean bedtime of 1:13am ( $SD = 68.85$  minutes) and a mean wake time of 9:09am ( $SD = 56.95$  minutes), resulting in average nightly time in bed of 7 hours and 56 minutes ( $SD = 59.47$  minutes). Sleep consistency scores were calculated for each participant by computing a within participant standard deviation for both bedtimes and wake times, and then averaging these two standard deviations. This measure of sleep consistency revealed substantial variability in sleep consistency with scores ranging from 7.65 minutes (describing a participant with highly consistent bed/wake times) to 156.27 minutes (describing a participant with over 2.5 hours of typical variability in their bed/wake times). Across all participants, the mean consistency score was 71.12 minutes ( $SD = 29.77$ ).

**Theory of Planned Behavior Constructs.** Scores of the TPB constructs were calculated such that higher scores indicate more favorable attitudes, perceived normative pressure, PBC, and behavioral intentions toward maintaining consistent sleep times for the next seven days. The



mean score for intention across groups was 4.91 ( $SD = 1.19$ ), indicating somewhat positive intentions to maintain consistent sleep and wake times. The predictors of intentions were also generally favorable; the highest mean score was attitude ( $M = 5.58$ ,  $SD = 0.88$ ), followed by perceived normative pressure ( $M = 4.60$ ,  $SD = 0.88$ ), and PBC ( $M = 4.58$ ,  $SD = 1.35$ ).

**Correlations Between Sleep Consistency and TPB Constructs.** Descriptive statistics and bivariate correlations between all of the measures are displayed in Table 1. The correlations between TPB Predictor variables were generally small to moderate in magnitude; the strongest relationship was between perceived normative pressure and attitudes ( $r = .47$ ). The correlations between each predictor and intentions were all significant, with PBC ( $r = .61$ ) being the best predictor of intentions. The correlation between intentions and sleep consistency was negative ( $r = -.25$ ,  $p < .05$ ) as expected, because lower consistency scores is indicative of greater consistency. Gender was analyzed for exploratory purposes, and found not to statistically correlate with any of the variables, including intentions and actual behavior.

### **Predicting Intentions**

To test the hypothesis that attitudes, perceived normative pressure, and PBC would combine to significantly predict intentions, all predictors were entered simultaneously into a multiple regression analysis using all of the participants. Standardized and unstandardized regression coefficients can be seen in Table 2. The overall model was significant,  $F(3, 63) = 24.36$ ,  $p < .001$ . Together the predictors accounted for 53.7% of the variance in intentions. PBC ( $p < .01$ ) and attitudes ( $p < .001$ ) were significant predictors, while perceived normative pressure was only approaching significance ( $p = .07$ ).

### **Predicting Sleep Consistency**

To test the hypothesis that intentions and PBC significantly predict sleep consistency, another multiple regression was performed simultaneously inputting PBC and intentions as predictors of sleep consistency. The overall model did not reach the .05 level of significance  $F(2, 34) = 2.10, p = .07$ , but the model did account for 6.2% of the variance in sleep consistency. Moreover, intentions were a significant predictor ( $p < .05$ ) but PBC was not ( $p = .65$ ). Standardized and unstandardized regression coefficients can be seen in Table 2.

### **Group differences**

Multiple t-tests were run to confirm that the groups did not differ on the predictor variables (measured prior to the experimental manipulation). As expected by random assignment to control ( $N = 32$ ) and experimental ( $N = 35$ ) groups, there were no differences between the groups on the predictor variables. For means, standard deviations, t-values, and significance see Table 3. Additionally the groups were tested to see if there were differences in sleep duration between the groups, there were no significant differences.

The implementation intention group reported better sleep consistency ( $M = 66.55$  Minutes,  $SD = 31.57$ ) than the control group ( $M = 76.33$  Minutes,  $SD = 27.53$ ). While the results are in the predicted direction, the difference was not statistically significant and the effect size was small,  $t(65) = 1.33, p = .19, d = 0.33, r = .16$ .

To test the hypothesis that the implementation intentions group would have a stronger intentions-behavior relationship, a correlational analysis was run separately for each group and it was found that the control group, not the experimental group, had a better intention-behavior relationship although this difference was not statistically significant. The Pearson correlation coefficient for the control group was  $r = -.54$  and statistically significant  $p < .01$  whereas the correlation for the experimental group was  $r = -.14$  and non-significant ( $p = .44$ ). The difference

between the correlations was assessed using the Fisher  $r$  to  $z$  transformation, but did not reach the .05 level of significance,  $z = 1.79$ ,  $p = .07$ .

### **Exploratory Analyses**

Given the unexpected effects for the experimental manipulation, differences between the implementation intention group and the control group were further analyzed with a series of exploratory analyses. A series of paired samples  $t$ -tests were conducted to determine if there was a difference from TPB time one variables, measured prior to other measures, to the TPB time two variables, measured after the completion of the sleep diary. In the control group there were no significant differences from time one to time two. In the experimental group there were significant differences between time one and time two for perceived normative pressure time one  $M = 4.54$  ( $SD = 0.93$ ), time two  $M = 4.17$  ( $SD = .97$ ),  $t(34) = 1.16$ ,  $p < .05$ ,  $d = 0.40$ ,  $r = 0.20$ , and intentions time one  $M = 4.82$  ( $SD = 1.31$ ), time two  $M = 4.01$  ( $SD = 1.61$ ),  $t(34) = 2.61$ ,  $p < .05$ ,  $d = 0.90$ ,  $r = 0.41$ , unexpectedly, with the first time measured being larger than the second time measured.

To further examine differences between the groups, separate regressions predicting intentions and sleep consistency were performed to observe possible differences in the regression coefficients between the groups. For the prediction of intentions from the TPB variables, the control group had 60.6% of the variance accounted for; attitudes ( $p < .01$ ) and PBC ( $p < .001$ ) were significant predictors whereas perceived normative pressure was not a significant predictor ( $p = .57$ ) of intentions. Similarly, the experimental group regression showed that the TPB variables explained 56.4% of the variance in intentions with PBC ( $p < .01$ ) as a significant predictor. However, in the experimental group perceived normative pressure ( $p < .05$ ) were significant and the attitudes measure was not a significant predictor of intentions ( $p = .28$ ).

A subsequent regression was performed to test the prediction of sleep consistency by intentions and PBC. The model accounted for 31.3% of the variance in consistent bed/wake times for the control group  $F(2, 31) = 6.60, p = .004$ , with intentions more strongly associated ( $\beta = -0.42, p = .05$ ) than PBC ( $\beta = -0.19, p = .37$ ). The implementation intentions group regression showed that PBC and intentions account for 9.8% of the variance in actual behavior  $F(2, 34) = 1.74, p = .19$ . PBC ( $\beta = 0.35, p = .10$ ) and intentions ( $\beta = -0.33, p = .11$ ) were not significant predictors of sleep consistency. Full regression results can be seen in Table 4.

### **Discussion**

The purpose of this study was to replicate previous findings that using TPB constructs significantly predicts intentions to engage in a behavior, and subsequently predict the behavior itself through the use of self-report measures with a college sample. Additionally, this study attempted to extend previous research by examining the use of implementation intentions to increase the consistency of bed and wake times.

The first hypothesis, that attitudes, perceived normative pressure, and PBC would significantly account for a large proportion of the variability in sleep consistency intentions, was supported. Overall attitudes, perceived normative pressure, and PBC predicted 53.7% of the variability in intentions. This finding is larger than some of the literature on other behaviors has reported (Armitage & Conner, 2001). This may be because of the specificity of the behavior as the constructs were constructed to exclusively capture variables in relation to “maintaining consistent bed and wake times for the next seven days.” Additionally, there were multiple items intended to capture each construct.

The fact that perceived normative pressure was not a significant predictor was not against the TPB model because perceived normative pressure is the weakest predictor (Armitage &

Connor, 2001; Fishbein & Ajzen, 2010). This however, may be ameliorated with replication with a larger participant population as perceived normative pressure was approaching significance ( $p = .07$ ).

Consistent with TPB, it was further expected that sleep consistency would be predicted by intentions and PBC would provide more explanatory power beyond what intentions provides alone. For this part of the hypothesis, this was not found to be the case. The overall model was not significant although it was approaching ( $p = .07$ ). The model predicted 8.0% of the variability of sleep consistency. With more participants, this relationship between intentions and the behavior may increase to significance. When looking at the specific constructs, PBC was found to not be significant but intention was found to be a significant predictor. Future studies may want to include past behavior as a variable in their analysis as some researchers believe that past behavior will add explanatory power (Sheeran & Orbell, 1999). Armitage and Sprigg (2010) found that implementation intentions may mediate the past behavior-future behavior relationship for some behaviors, however sleep behavior was not one of the behaviors that they investigated and may not have the same relationship. More research should be done on the past behavior-future behavior relationship of sleep as well as implementation intentions ability to mediate this relationship before any conclusions can be drawn as to past behaviors impact on sleep specifically sleep consistency.

The second hypothesis, that the implementation intentions group would have a stronger intention-behavior relationship was not supported. In fact through a correlational analysis, it was found that the control group, not the experimental group, had a significant correlation between intentions and sleep consistency. The reason for this could be the variability in intentions. Intentions may change over time and this study only recorded intentions prior to and after the

behavior was performed. Future studies should record multiple intentions at different times measured concurrently with the behavior. This may help enhance the ability of TPB to predict behavior, specifically difficult to perform behaviors.

Another difficulty for this hypothesis, is that the procedure followed in this study gave experimental participants the TPB measures prior to the implementation intentions, which could have changed their behavioral intentions. Support for this may be shown from the fact that the experimental groups' perceived normative pressure and intentions significantly changed from the first time measured to the second time measured, where all of the control groups' variables did not significantly differ. This is important because, for the experimental group, perceived normative pressure was a significant predictor of intentions, however intentions was not a significant predictor of behavior.

The final hypothesis, that the implementation intentions group would maintain more consistent bed and wake times was not supported. The experimental group did report more consistent bed and wake times, but the difference was not statistically significant and the effect size was small. This shows some ability for the behavior of sleep consistency to be changed, however in its current conceptualization; implementation intentions were unable to make the change significant. As with the previous hypothesis, the inclusion of more participants may make this significant but again the effect size is small, possibly due to the difficulty of sleep consistency behavior.

There were several limitations present in the current study. First, the use of sleep diaries, while adding ecological validity, are most effective in their goal of attaining objective behavior when completed as close to the behavior as possible. While the participants were told of the importance of the completion immediately prior to going to bed, right after waking up, and there

were reminder e-mails sent, there was no way to ensure that the participants completed the sleep diaries as instructed. Online versions of the sleep diaries could be used in future studies to empirically ensure that participants are filling them out immediately prior to going to bed and immediately after waking up.

A second limitation with the current study is the lack of an objective measure of sleep consistency. While it is the custom of sleep researchers to use sleep diaries for this type of research, the addition of an objective measure such as polysomnography or actigraphy would increase the validity of the findings and may lead to more clear results. Fishbein and Ajzen (2010) have argued that, for most behaviors, self-reports are generally acceptable, but they still recommend gathering both self-report and objective measures when possible, and gathering supplemental data is usually helpful.

A third limitation with the current study is the temporal element combined with the sample type. All of the data in the present study was collected between the dates of March, 20<sup>th</sup> 2014 and April, 25<sup>th</sup> 2014. This, for the school that the data was collected from, was the last month of the spring semester. Oftentimes for the group studied, and validated by some of the comments in the sleep diaries, the last month in the semester is rife with projects, papers, tests, parties, and studying for finals. Any one of these or a combination of these can play havoc on sleep behaviors but especially for consistency. Future studies investigating this population should gather data over the course of an entire semester so that the influence of these extraneous temporal and population specific variables would potentially not weigh as heavily on the outcomes.

There are a plethora of directions that sleep and TPB research can go. Specifically, researchers can delve further into the idea of changing sleep hygiene behaviors using

implementation intentions and the TPB to observe if any of them can be changed with implementation intentions or to observe if sleep behaviors do not react to implementation intentions like other behaviors. Further on this point, Fishbein and Ajzen (2010) state that through the identification of salient modal beliefs in the population of interest, interventions can be targeted to the critical beliefs specified for a particularly population and behavior (e.g., college student consistent sleep). For instance, the current study reported that PBC, thought to add predictive power beyond intentions, was not significant when predicting behavior. Further studies should examine the relationship between sleep consistency and PBC as well as implementation intentions ability to change PBC.

Future research should remain on these lines because attitudes were already generally high for sleep consistency behavior. Fishbein and Ajzen (2010) state that providing information and/or trying to change attitudes are ineffective if the attitudes are already positive and the behavior is not being performed. Additionally, perceived normative pressure in this study was found to not be a significant predictor of intentions, which the TPB states intentions are the closest proximate to behavior. So, modifying perceived normative pressures may have little effect on intentions or actual behavior. Subsequent research should replicate and validate that perceived normative pressure is not a significant predictor of intentions for sleep consistency.

Future research should also examine the temporal aspect of the semester and adherence to sleep consistency. As stated earlier, the data collection of the current study was in the last month of the spring semester; this could dramatically affect sleep consistency (more so than other sleep hygiene behaviors). Researchers should observe changes in sleep consistency, duration, and other sleep hygiene behaviors such as avoiding caffeine, large meals, and exercise before bed over an entire semester. Beyond these, because sleep consistency involves both bed and wake



times, behaviors of waking (i.e. how people wake, how much coffee consumed, number of times snooze button was pressed) should be investigated alongside bedtime behaviors.

## **Conclusion**

In conclusion, the findings from this study are generally consistent with previous research using the TPB to predict health behavior and support the use of this theoretical framework to predict intentions to maintain consistent bed and wake times, however may not be as accurate predicting actual sleep behavior. The results were generally consistent with previous research demonstrating that intentions to engage in consistent sleep can be predicted from a combination of attitudes, perceived normative pressure, and PBC, with the notable exception that perceived normative pressure was not a significant predictor. These findings have added to the limited amount of research on sleep behaviors, the use of implementation intentions and the TPB. The results did not support the idea that implementation intention increases the strength of the intention-behavior relationship. The results also did not statistically support the idea that implementation intentions increase the consistency of bed and wake times although the results were in the correct direction. The current results still point to PBC as the mechanism to focus on for the change in sleep consistency, however shows that implementation intentions may not be the mechanism to do so. However, future research is needed to replicate and confirm the present findings as well as to test other aspects of sleep hygiene and implementation intention's ability to change behavior.

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Table 1

Descriptive Statistics and Bivariate Correlations ( $N = 67$ )

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Attitudes	5.58	0.88	-				
2. Perceived Normative Pressure	4.60	0.88	.47**	-			
3. Perceived Behavioral Control	4.58	1.19	.16	.35**	-		
4. Intentions	4.91	1.19	.47**	.50**	.61**	-	
5. Sleep Consistency	71.12	29.77	-.05	-.05	-.13	-.28*	-
6. Participant Gender	1.44	0.50	.08	-.06	.07	.08	.06

Gender coded as 1= men, 2 = women.

\* $p < .05$  \*\* $p < .01$



Table 2.

Regression Analyses for Predicting Sleep Consistency Intentions and Behavior.

(N = 67)				
	<i>b</i>	<i>SE</i>	$\beta$	<i>R</i> <sup>2</sup>
Predicting Intentions				.54**
Attitude	0.40	0.13	0.30*	
PNP	0.26	0.13	0.19	
PBC	0.44	0.08	0.50*	
Predicting Behavior				.08
PBC	-93.03	201.02	0.07	
Intentions	-478.04	226.45	0.32*	

\* $p < .05$  \*\* $p < .01$ 

PBC = perceived behavioral norms, PNP = Perceived normative pressure

Table 3.

Differences in Predictor Variables Across Groups.

TPB Variable	Control Group		Experimental Group		t-Test	
	(N = 32)		(N = 35)		(N = 67)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	t-value	<i>p</i>
Attitude	5.59	0.85	5.56	0.93	0.10	0.92
PNP	4.66	0.82	4.54	0.94	0.52	0.60
PBC	4.64	1.43	4.52	1.29	0.35	0.73
Intentions	5.01	1.07	4.83	1.31	0.60	0.55

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PBC = perceived behavioral norms, PNP = Perceived normative pressure

Table 4.

Regression Analyses for Predicting Sleep Consistency Intentions and Behavior (Control vs. Experimental)

	Control ( <i>N</i> = 32)				Experimental ( <i>N</i> = 35)			
	<i>b</i>	<i>SE</i>	$\beta$	<i>R</i> <sup>2</sup>	<i>b</i>	<i>SE</i>	$\beta$	<i>R</i> <sup>2</sup>
Intentions				.61**				.56**
Attitude	.54	.16	.43*		.22	.20	.16	
PNP	-.10	.17	-.06		.57	.21	.41*	
PBC	.45	.09	.60**		.41	.13	.40*	
Consistency				.31*				.10
PBC	-216.76	237.37	-.19		509.21	302.27	.35	
Intentions	-635.65	317.02	-.42^		-482.96	296.88	-.33	
^ <i>p</i> = .05 * <i>p</i> < .05 ** <i>p</i> < .01								

PBC = Perceived behavioral norms,

PNP=Perceived normative pressure

### Appendix A: TPB Questionnaire

#### Theory of reasoned action applied to healthy sleep habits: Consistent sleep wake times.

On the scales below, please choose the one that most closely corresponds to your opinion regarding **maintaining consistent sleep and wake times each day, for the next 7 days**. Consistent sleep and wake times mean going to sleep at the same time each night, and waking up at the same time each morning the next day

#### (Behavioral intention items)

I intend to maintain consistent sleep and wake times in the next week (i.e., going to sleep and waking up at the same time every day)

Definitely False : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : Definitely True

I will make an effort to maintain consistent sleep and wake times for the upcoming week

Extremely unlikely : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : Extremely likely

I want to maintain a consistent sleep wake cycle for the next seven days

Definitely False : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : Definitely True

I expect to maintain consistent sleep and wake times for the upcoming week

Extremely unlikely : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : \_\_\_\_\_ : Extremely likely

I am willing to maintain consistent sleep and wake times for the next seven days

Definitely False : \_\_\_\_\_ : Definitely True

I plan to maintain consistent sleep and wake times for the next week

Definitely False : \_\_\_\_\_ : Definitely True

**(Attitude toward the behavior items)**

For me to maintain consistent sleep and wake times (going to bed and waking up at the same time daily) is...

Bad : \_\_\_\_\_ : Good

Positive : \_\_\_\_\_ : Negative

Valuable : \_\_\_\_\_ : Worthless

Unpleasant : \_\_\_\_\_ : Pleasant

Enjoyable : \_\_\_\_\_ : Unenjoyable

Harmful : \_\_\_\_\_ : Beneficial

Wonderful : \_\_\_\_\_ : Awful

Boring : \_\_\_\_\_ : Appealing

Important : \_\_\_\_\_ : Unimportant

Necessary : \_\_\_\_\_ : Unnecessary

Foolish : \_\_\_\_\_ : Wise

Productive : \_\_\_\_\_ : Unproductive

Sick : \_\_\_\_\_ : Healthy

Detrimental : \_\_\_\_\_ : Constructive

**(Perceived normative pressure items)****[Injunctive]**

Most people who are important to me think that I should maintain consistent sleep and wake times

Definitely False : \_\_\_\_\_ : Definitely True

The people in my life whose opinions I value would

Approve : \_\_\_\_\_ : Disapprove

of my maintaining consistent sleep and wake times.

Most people that I respect and admire think that I

Should : \_\_\_\_\_ : Should not

maintain consistent sleep and wake times.

It is expected of me that I maintain consistent sleep and wake times every night

Definitely False : \_\_\_\_\_ : Definitely True

I feel social pressure to maintain consistent sleep and wake times.

Strongly Disagree : \_\_\_\_\_ : Strongly Agree

**[descriptive]**

Most people I respect and admire maintain consistent sleep and wake times

Unlikely : \_\_\_\_\_ : likely

Most people who are important to me maintain consistent sleep and wake times

Definitely true : \_\_\_\_\_ : Definitely false

Most people like me maintain consistent sleep and wake times

Strongly Disagree : \_\_\_\_\_ : Strongly Agree

The people in my life whose opinions I value

Do not : \_\_\_\_\_ : Do

Maintain a consistent sleep and wake times

**(Perceived behavioral control)****[capacity]**

For me to maintain consistent sleep/wake times every night would be...

Impossible : \_\_\_\_\_ : Possible

If I wanted to I could maintain consistent sleep and wake times every night

Definitely false : \_\_\_\_\_ : Definitely true

It would be

Very easy : \_\_\_\_\_ : Very difficult

For me to maintain consistent sleep and wake times

I am confident that I can maintain a consistent sleep and wake times

Definitely false : \_\_\_\_\_ : Definitely true

### [Autonomy]

How much control do you believe that you have over maintaining a consistent sleep/wake  
cycle?

No control : \_\_\_\_\_ : Complete control

It is mostly up to me whether I get go to sleep and wake up at the same time each day

Strongly disagree : \_\_\_\_\_ : Strongly agree

For me to maintain a consistent sleep wake cycle is...

Not at all : \_\_\_\_\_ : Completely

Under my control

The number(s) of events outside my control which could prevent me from maintaining a  
consistent sleep/wake cycle are ...

Numerous : \_\_\_\_\_ : Very few



### **Appendix B: Implementation Intentions**

Starting today, we would like you to try to maintain consistent sleep and wake for the next seven days. That is, we would like you to try to go to bed at approximately the same time each night, and wake up to start your day at the same time.

Please specify a bedtime and a wake time

Bed time: \_\_\_\_\_

Wake time: \_\_\_\_\_

Please say to yourself: “I will maintain consistent sleep and wake times for the next seven days.”

Please repeat this intention one more time to yourself.

Research has shown that despite intending to have a consistent sleep schedule, many people fail to do so. To give yourself the best chance of success it can be helpful to make specific plans about the behavior. Please follow the examples and create a specific plan on how to maintain consistent sleep and wake times for the following week.

Formula sentences

When I’m in situation \_\_X\_\_ then I will do \_\_Y\_\_.

Example 1:

When my phone reads 9:30 I will go into my bedroom turn off my lights and sleep.

Example 2:

When my alarm goes off in the morning I will wake up and start my day.

Please provide three to five sentences conforming to this format (when I'm in situation X then I will do Y) related to maintaining consistent sleep and wake times.

1.)

2.)

3.)

4.)

5.)

Once completed with the sentences make sure that both of the following criteria are met:

1. Do your plans contain the words IF, THEN, and I?
2. Do your plans identify enough situations for you to maintain consistent sleep and wake times for the next seven days?

If your plans do not meet the criteria then form new plans that meet the criteria.

Next, Please specify any situation(s) specific to you that might prevent you from sleeping at the previously determined time and something that you can do to prevent it... \_\_\_\_\_ (open ended).

Lastly, Please specify any situation(s) specific to you that might prevent you from waking at the previously determined time and something that you can do to prevent it... \_\_\_\_\_ (open ended).

## Appendix C: Sleep Diary Worksheet

WAKE-UP LOG	
<p>1. What day is today? (check the corresponding box)</p> <p><input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> T <input type="checkbox"/> W <input type="checkbox"/> T <input type="checkbox"/> F <input type="checkbox"/> S</p>	<p>8. Rate the quality of your sleep last night. (1 = excellent; 5 = poor)</p> <p>excellent <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 poor</p>
<p>2. What time did you go to bed last night? (write in response and mark AM or PM)</p> <p>_____ : _____ <input type="checkbox"/> AM (after midnight)  <input type="checkbox"/> PM (before midnight)</p>	<p>9. What time did you wake up to start your day? (write in response and mark AM or PM)</p> <p>_____ : _____ <input type="checkbox"/> AM (before noon)  <input type="checkbox"/> PM (afternoon)</p>
<p>3. Did you feel ready for sleep when you went to bed?</p> <p>YES <input type="checkbox"/> NO <input type="checkbox"/></p>	<p>10. How long did you sleep last night?</p> <p>Hours: _____ And _____ (example: 8 hours, 15 minutes)  Minutes: _____</p>
<p>4. Did you take anything to help you sleep?</p> <p>YES <input type="checkbox"/> NO <input type="checkbox"/></p>	<p>11. How difficult was it to wake up? (1 = very easy; 5 = very hard)</p> <p>Very easy <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 very hard</p>
<p>5. How long did it take you to fall asleep?</p> <p>Hours: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> More than 4  Minutes: <input type="checkbox"/> 0 <input type="checkbox"/> 5 <input type="checkbox"/> 10 <input type="checkbox"/> 15 <input type="checkbox"/> 20 <input type="checkbox"/> 25  <input type="checkbox"/> 30 <input type="checkbox"/> 35 <input type="checkbox"/> 40 <input type="checkbox"/> 45 <input type="checkbox"/> 50 <input type="checkbox"/> 55 <input type="checkbox"/> 60</p>	<p>12. How rested/refreshed do you feel now? (1 = very rested; 5 = not at all)</p> <p>Very rested <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 not at all</p>
<p>6. How many times did you wake up during the night?</p> <p><input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> More than 9</p>	<p>13. Comments:</p>
<p>7. Altogether, how long were you awake during the night after you initially fell asleep?</p> <p>Hours: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> More than 4  Minutes: <input type="checkbox"/> 0 <input type="checkbox"/> 5 <input type="checkbox"/> 10 <input type="checkbox"/> 15 <input type="checkbox"/> 20 <input type="checkbox"/> 25  <input type="checkbox"/> 30 <input type="checkbox"/> 35 <input type="checkbox"/> 40 <input type="checkbox"/> 45 <input type="checkbox"/> 50 <input type="checkbox"/> 55 <input type="checkbox"/> 60</p>	

  

BEDTIME LOG	
<p>1. What day is today?</p> <p><input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> T <input type="checkbox"/> W <input type="checkbox"/> T <input type="checkbox"/> F <input type="checkbox"/> S</p>	<p>6. How many naps did you have today?</p> <p><input type="checkbox"/> NONE <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> More than 4</p>
<p>2. Did you experience physical discomfort today? Mark all that apply.</p> <p><input type="checkbox"/> Headache <input type="checkbox"/> Upset stomach  <input type="checkbox"/> Cold/allergy symptoms <input type="checkbox"/> Menstrual cramps  <input type="checkbox"/> Muscle/joint pain  <input type="checkbox"/> Other: _____</p>	<p>7. Altogether, how much time did you nap today?</p> <p>Hours: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> More than 4  Minutes: <input type="checkbox"/> 0 <input type="checkbox"/> 5 <input type="checkbox"/> 10 <input type="checkbox"/> 15 <input type="checkbox"/> 20 <input type="checkbox"/> 25  <input type="checkbox"/> 30 <input type="checkbox"/> 35 <input type="checkbox"/> 40 <input type="checkbox"/> 45 <input type="checkbox"/> 50 <input type="checkbox"/> 55 <input type="checkbox"/> 60</p>
<p>3. Did you take any medications today (including over-the-counter medications)?</p> <p><input type="checkbox"/> YES <input type="checkbox"/> NO  If yes, specify: _____</p>	<p>8. If you had vigorous physical activity for at least 15 minutes today, circle below every hour this occurred.</p> <p style="text-align: right;"><input type="checkbox"/> NONE</p> <p>12(Noon) 1 2 3 4 5 6 7 8 9 10 11 am  12(Midnight) 1 2 3 4 5 6 7 8 9 10 11 pm</p>
<p>4. How many caffeine drinks did you consume today? (e.g. Coke, tea, coffee, etc.)</p> <p>Morning(before noon) <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 5+  Afternoon <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 5+  Evening(after 6 pm) <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 5+</p>	<p>9. Comments:</p>
<p>5. How many drinks of alcohol did you have today?</p> <p><input type="checkbox"/> NONE  <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9  <input type="checkbox"/> More than 9</p>	